The extended wedge method:

Atomic force microscope friction calibration for improved tolerance to instrument misalignments, tip-offset, and blunt probes

H.S. Khare, D.L. Burris, Review of Scientific Instruments 84 (2013) 055108 [web]

Instructions for using the LFM template

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This document provides instructions for using the solver template for the extended wedge method calculations, outlined in the *Review of Scientific Instruments* paper. Examples shown in the following pages correspond to MS Excel 2010.

Before you begin

Check version of MS Excel

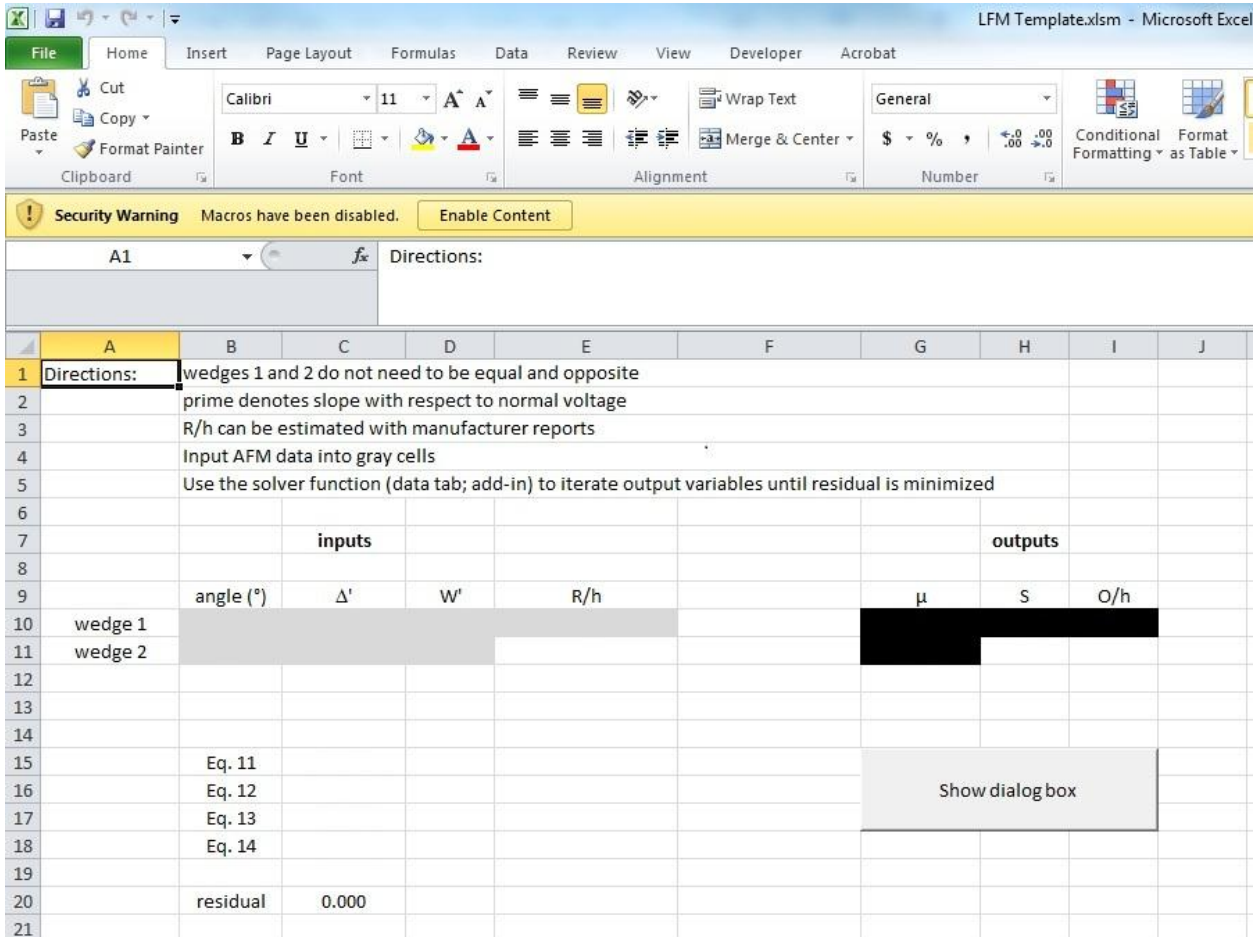
Ensure that you are using the correct file for your version of MS Excel. The solver template is written as an MS Excel macro and has been tested to work with MS Excel 2010 and MS Excel 2007, on platforms running both 32bit and 64bit Windows Vista/7.

Enable macros

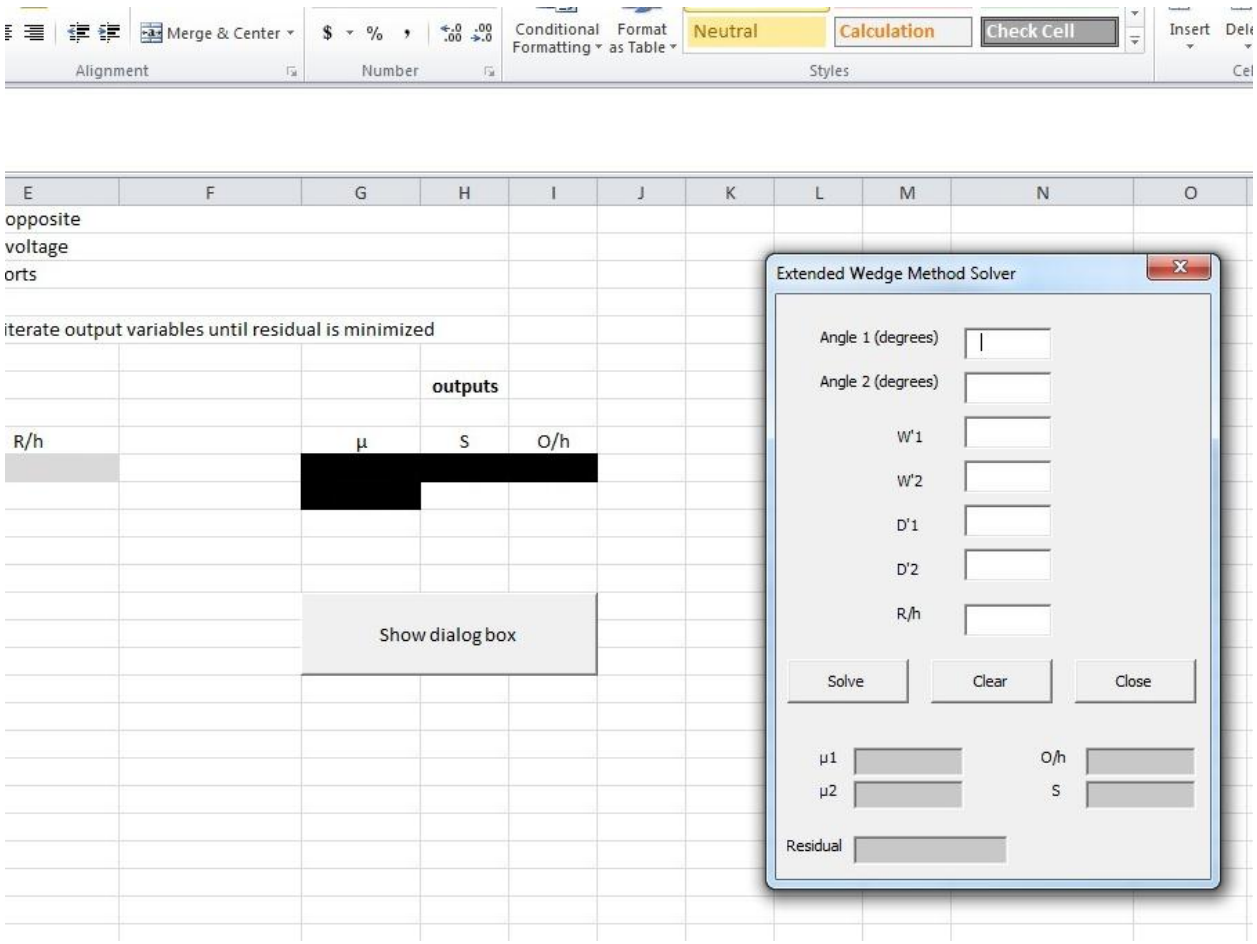
Ensure that macros are enabled in MS Excel. When you open the LFM template file, MS Excel may prompt you to enable macros – select ‘yes’ if prompted.

Installing solver add-on

The Solver add-on for MS Excel is typically installed automatically with the installation of MS Office. If however the Solver add-on has not been installed on your system, you will be prompted to install this when you open this file (typically in MS Excel 2007). If prompted, select ‘yes’ and follow on-screen instructions to install this add-on. Such an installation will typically not require you to insert the original MS Office CD.



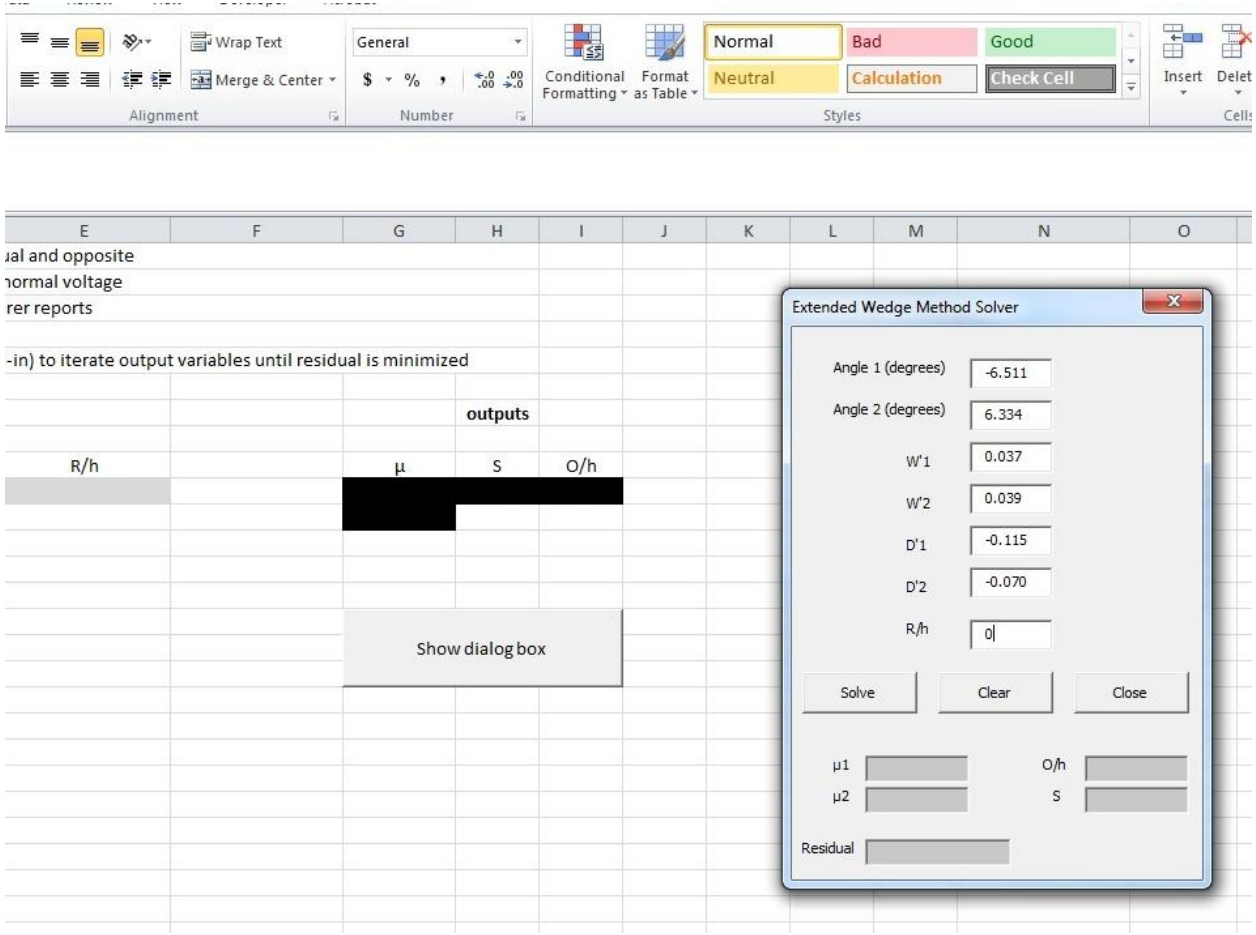
Step 1: After opening the LFM Template file, you may be shown a security warning indicating that macros are disabled. Click ‘Enable Content’ to make sure macros are enabled.



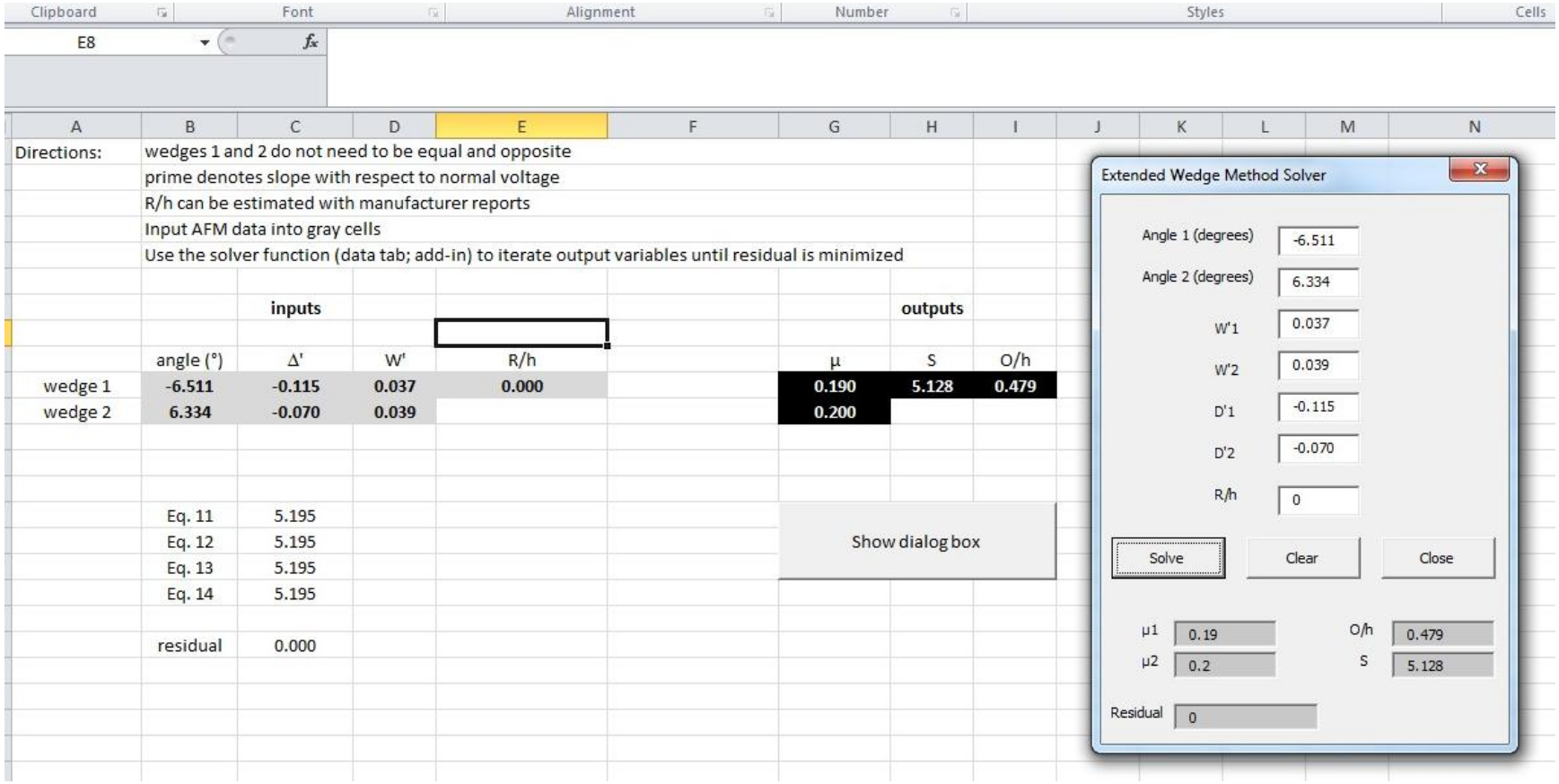
Step 2: A dialog box appears with fields for the different input parameters:

W'1 and W'2 refer to W'_1 and W'_2 respectively (slopes of friction loop width); D'1 and D'2 refer to Δ'_1 and Δ'_1 respectively (slopes of offsets)

Angle 1 and Angle 2 refer to θ_1 and θ_2, respectively. R/h refers to the ratio of tip radius to tip height, which can be approximated with manufacturer reports, microscopy measurements, or 0 for integrated tips and 0.4 for spherical, colloidal tips.

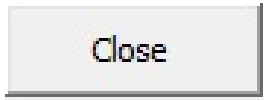


Step 3: Enter values of the input parameters as shown, and click “Solve”.



Step 4: The values of friction coefficients μ1 and μ2, tip-offset ratio O/h and sensitivity S are evaluated and displayed both in the dialog box, as well as the data spreadsheet. The value of the residual (standard deviation in the values from Eqns. 11-14) is also shown.

The ‘Clear’ button clears the fields of the user-input dialog box



The ‘Close’ button closes the user-input dialog box

Clicking on ‘Show dialog box’ launches the user-input dialog box